A MOMENTARY LAPSE

Usually, any Metric screwcutting I need to do occurs on jobs which are set up in my LittleJohn lathe. On this occasion I was using my Harrison L5 for a job which required me to cut a 10mm thread. Although the L5 lathe has been fitted with metric crossfeed and topslide, it has an Imperial leadscrew.

The instructions for cutting metric threads require a compound gear train 50:40, 60:127. The Norton Gearbox set to 20TPI ought to produce the correct pitch for the 10mm thread. I fitted the gears, and using a 1.5mm screw pitch gauge after the first cut, the pitch appeared to be correct so I proceeded with the work. I find the "*Step forward - step back*" technique for screwcutting unpredictable and error prone, so I prefer the 30 degree set over method. On this occasion I had ground the tool for cutting on one face only. I had thought for some time that there was no point in having a tool without rake when cutting on one face and had been thinking of grinding a top rake. I recently found out from a (very) old issue of Model Engineer that cutting top rake is indeed the right thing to do if the tool is being used in the manner which I employ! The difference in cutting was remarkable and the machining went very smoothly.

I usually find that finishing with a die produces a nice thread, so I went ahead and did so. The result was disastrous. It can be seen from a cursory inspection of Photo 1 that the thread appears acceptable for the first few threads, then the next few were almost entirely removed and finally the last few threads again appear acceptable. Of course every turn of the thread is unsatisfactory.

Photo 1.

There is nothing sacrosanct about thread pitches and had I not ruined the job with the die, it could have been used in principle. It would merely have required the thread depth to suit the actual pitch and a suitable nut to be cut at the same pitch. I might just have done so for the fun of it.

Photo 2. The incorrect gear train.

It dawned on me that by oversight I had fitted the 40 tooth and 60 tooth gears back to front as shown in Photo 2. This meant that the actual ratio was 50:60 x 40:127 which works out to 100:381. Careful inspection revealed that by fitting the gears incorrectly, the pitch was somewhere between 1.25mm and 1.5mm.

The correct gear train according to the instructions is shown in Photo 3. In this case, the gear ratio reduces to 75:127 between the headstock and the gearbox input shaft.

Photo 3. The "Correct" gear train.

However, using the correct gear train, something was very wrong. The pitch was most definitely 3mm!

I ought to have noticed the discrepancy when I took the initial light cut and matched it against the 1.5mm pitch gauge. Three millimetres would have been an obvious discrepancy, but the smaller error resulting from the incorrect gear train escaped my notice and when I finished the thread with the die, the outcome was inevitable.

Nevertheless, with the gears correctly fitted, and the tumblers on the gearbox set according to the instructions which came with the lathe, the pitch was indeed 3mm.

Rather than using the setting for 20tpi, the setting for 40tpi was required to produce the correct pitch. With this done, and the cutting tool aligned with the remains of the thread on the job, the tool ran absolutely cleanly along the length.

It is apparent that the Norton gearbox and leadscrew arrangement fitted to my L5 lathe does not correspond to that described in the instructions provided. The ratio differs by a factor of 2 to that described in the manual. All the TPI values on the plate provided with the Harrison have to be doubled in order to achieve the corresponding metric pitch shown.

On further consideration I realised that the usual ratio between the Headstock and Norton gearbox is 1:4 for producing the correct Imperial pitches. My incorrect gear train gave a ratio of 100:381 instead of the 1:4 and so the effective change in pitch was 400:381 = 1.0499. A 20TPI thread has a pitch of 1.27mm, so it was increased to 1.27 x 1.0499 = 1.33mm.

The "*Correct*" gear train of 75:127 produced an effective pitch change of 300:127 = 2.3622. Consequently the 20 tpi became 1.27 x 2.3622 = 3.0mm as I had discovered.

I'd like to think that I won't make the same mistake again, but I'm sure I'm well capable of repeating the blunder. Having to remember to double the setting on the Norton gearbox seems a bit onerous. There are not many changewheels with my L5, but I had an 80 tooth gear which was exactly what I required.

Substituting the 80 for the 40 tooth gear to give a gear train of 50:80 x 60:127 = 75:254 cancelled the factor of 2. This happy arrangement which allows me to use the recommended gearbox settings for metric screwcutting is shown in photo 4.

Now I can hope to get my metric thread pitches correct, but I am quite confident that there is still plenty of potential for me to ruin jobs.

There will always be scope for one more error.

Photo 4. A sensible gear train for metric pitches on my L5.

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